but those in the lower Arkansas and the rivers of southern Mississippi and western Alabama were very pronounced and destructive, especially in southern Mississippi.

The flood in the lower Arkansas River and tributaries was caused by the heavy rains of May 23 and 24, and flood stages were reached generally on May 25. The crest stage at Fort Smith, Ark., was 26.6 feet on May 27, 4.6 feet above the flood stage; at Little Rock, Ark., 23.5 feet, on May 29, 0.5 foot above flood stage; and at Pine Bluff, Ark., 27.0 feet, on May 30, 2.0 feet above flood stage. The losses amounted to about $300,000, of which two-thirds was in crops, while the value of property saved by the flood warnings was about $60,000. Damage to lands by erosion amounted to about $12,000.

The southern Mississippi and Tombigbee River floods resulted from the excessive rains that began about May 24, and before they subsided in early June some very high stages had been recorded. At Jackson, Miss., on the Pearl River the crest stage was 35.3 feet on May 30, 15.3 feet above the flood stage; at Columbia, Miss., 27.0 feet on June 5, 7.0 feet above the flood stage; at Enterprise, Miss., on the Chichasawhay River, 36.0 feet on May 27, 18.0 feet above flood stage and the highest water of record; at Merrill, Miss., on the Pascagoula River, 25.1 feet on June 4, 5.1 feet above flood stage; at Demopolis, Ala., on the Tombigbee River, 51.1 feet on June 11, 16.1 feet above the flood stage; and at Tuscaloosa, Ala., on the Black Warrior River, 51.6 feet on June 5.

About 70,000 acres of lowlands along the Black Warrior and Tombigbee rivers were inundated, and the losses in Alabama and Mississippi amounted to about $980,000, divided as follows:

Crops	$600,000
Property other than crops	150,000
Damage to farm lands	30,000
Suspension of business	200,000
Total	$980,000

The value of the property saved through the Weather Bureau warnings was about $55,000, a small amount when compared with the losses, but representing nevertheless, all that there was to save at this season of the year.

The losses during the Allegheny River flood on May 1 and 2 amounted to $65,000, and the value of property saved by the Weather Bureau warnings was about $75,000.

The annual rise of the Missouri and Columbia rivers set in during the month, but no flood stages were reported. The Ohio River rise resulted in stages close to the flood stage, and on May 13 passed into the Mississippi River, where the crest stages were also close to the flood stage. At the end of the month the river was still rising at New Orleans, La. The upper Mississippi River was comparatively quiet at stages that are to be expected at this time of the year.

The highest and lowest water, mean stage, and monthly range at 217 river stations are given in Table IV. Hydrographs for typical points on seven principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Missisipi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor of Meteorology.*

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

A BALLOON AMONG THUNDERSTORMS.

By CHARLES J. GLIDDEN. Dated Pittsfield, Mass., May 25, 1909.

Aeronauts in the balloon *Massachusetts* that ascended from Pittsfield on the afternoon of May 24, 1909, had an unusual experience. At an elevation of one mile and thirty minutes after the start, three showers and thunderstorms were noticed, one in the Hoosic Valley, another in the Connecticut, and the third near Worcester. The balloon rose and fell through intervals varying from 1,000 to 10,000 feet, and several times was caught in varying currents which caused the basket to turn and swing from side to side. Under one mile elevation the balloon traveled in advance of one of the storms at a speed of about forty miles an hour, while at an elevation of 10,000 feet calm and sunshine prevailed with the storm rapidly passing below them. Lightning flashes were frequent and heavy peals of thunder shook the basket. After the storms had passed under the balloon a rift in the clouds enabled the aeronauts to drop down into a clearing free from clouds and to make a landing without difficulty. This established the fact that above the storm there existed bright sunshine and no wind.

THE 24-HOUR DAY.

By CHAS. A. MIXER, C. E. Dated Rumford Falls, Me., July 17, 1909.

The letter from Mr. Clayton in the March number of the REVIEW, dated June 28 and received to-day, viz, on the adoption of the Kelvin thermometer scale and the metric system, interests me. I wish to approve his recommendation and to add a suggestion intended to complete the recommendation. Really it is a repetition rather than a suggestion, for I have written of it before, but not recently. It is, Adopt the 24-hour time. For seventeen years I have been using the 24-hour day; not alone in my weather records but primarily in all the hydraulic and electric records of our business. It is very easy for even untrained workmen to adopt and use the 24-hour time, and to use it with less error than the 12 hours with A. M. and P. M. With the 24-hour system, "10:40 hr." can mean only one time in the day. It is as easy to write and to think "16-hr." as it is "4 P. M."

Within two weeks I have read in the newspapers that the Russian Government has adopted the 24-hour time. I do not now remember the paper and can name no authority, but I was glad to read of the adoption.

A SIMPLE APPLICATION OF THE THEORY OF PROBABILITIES TO WEATHER PREDICTION.

By C. E. VAN ORSTRAND. Dated Washington, D. C., June 15, 1909.

In the present state of meteorological science, it is recognized that precise predictions of weather conditions for moderate intervals of time are impossible. This imperfection of the science is due to many causes, the most important of which is the uncertainty in both velocity and direction of the approaching storm. Since the forecaster must necessarily take these and other uncertainties into account, it would seem that the most logical method of procedure would be to state the prediction in terms of probabilities in order that the forecaster may more accurately take into account the various factors of the problem; and thus be able to give to the public, in a definite statement, all of the specific information which science is capable of yielding for a particular weather condition; and no more.

This requirement may be met, in a way, by stating the prediction in terms of two scales, each on a basis of 10. On the first scale is represented the probability of the predicted phenomena, and on the second, the estimated amount or intensity. Suppose, for example, that a prediction is to be made on the rainfall in a given area. The maximum rainfall in twenty-four hours is represented by 10 on the second scale of the diagram (Fig. 1); one-half the maximum by 5, and so on to 0, which means no precipitation. On the probability scale, 10 means certainty, probability unity; 5 means an even chance, and so on to 0, which means that there is not the slightest probability of a rainfall in a given area during a time interval for which the prediction is made. The symbols 8-4 would thus mean that the chances are 8 to 2 in favor of rain and that the total precipitation would be about 0.4 of the maximum. The symbols 2-9 would indicate that the chances are only 2 to 8 in favor of rain and that a heavy precipitation might be expected in case the storm reached the given area. Less accurately, a heavy precipitation with an approach to certainty is indicated when both targets occupy the upper third of the diagram; an average precipitation with about an even chance of its occurrence would be represented by both targets in the middle third; while uncertain weather conditions and light showers would be represented by both targets in the lower third. The left target near the bottom and the right one near the top would indicate a severe storm not far distant, either passing or approaching; while the left target near the top and the right one near the bottom would mean that the probability of light showers is almost unity. The system of nomenclature would not therefore be unintelligible to persons unfamiliar with the theory of probabilities and the ease with which the predictions could be distributed in rural districts by means of the telephone, or exhibited on the streets and elsewhere by means of simple mechanical devices, is suggestive of its usefulness in these respects. Furthermore, the publication of the numbers with the usual forecasts would give additional and precise information not easily expressed in a few words.

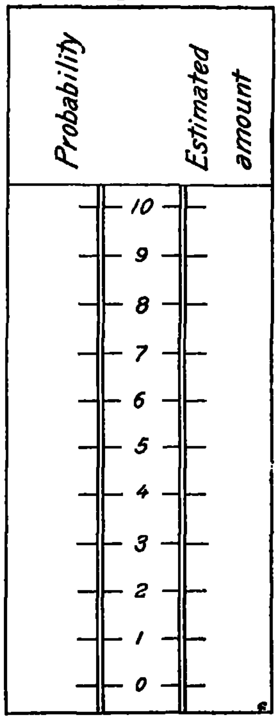

FIG. 1.—Forecast scale, Van Orstrand.

For the most part, the first column may be said to represent the forecaster's estimate of the storm's rate of approach, or, in general, it is the weight which he assigns to the predicted phenomena; and the second column is his estimate of the magnitude or intensity of the predicted phenomena, such as amount of rainfall, temperature conditions, wind velocity, percentage cloudiness, etc. Were meteorology an exact science, the first column, or number, would not be needed, and the numbers in the second column could be foretold to a fair degree of precision for comparatively long intervals of time. Until this stage in the development of the science of meteorology is reached, the more nearly the predictions can be stated in terms of probabilities, the more nearly will meteorologists be able to interpret the various weather conditions, for the benefit of the public, in strict accordance with scientific principles.

COMMENT BY PROF. H. C. FRANKENFIELD.

Doctor Van Orstrand's scheme is very similar to, although somewhat more elaborate than that devised and put into operation in 1905 by W. Ernest Cooke, Esq., Government Astronomer for Western Australia. That scheme was commented on by Prof. E. B. Garriott.[1]

In my opinion both schemes are defective in that while aiming to avoid positive statements (as a rule) in weather forecasts, they fall into exactly the difficulty they are attempting to avoid. There are but three possibilities on the weather chart, as follows:

1. There will be precipitation within a given period.
2. There will not be precipitation within a given period.
3. It is doubtful whether or not there will be precipitation within a given period.

In the present state of our meteorological knowledge any elaboration of these three possibilities will tend only to confuse the situation, and to necessitate attempts at precision beyond the ability of the forecaster with the material at hand. If there is doubt in his mind, it is useless to attempt to qualify it.

The second proposition of Doctor Van Orstrand relative to forecasts of the intensity or quantity of precipitation is open to still greater objections. Logical forecasts of the quantity of precipitation are absolutely impossible, except with two types of storms. In one of these two types the depression moves down the western slope of the Rocky Mountains into western Texas, and then recurves northeastward through the Ohio Valley. In the other type the depression moves from the Pacific Ocean through Mexico into Texas, and thence northeastward. Both these types are attended by heavy rains or snows about 95 per cent of the time. From all other storm types the quantity of precipitation will vary from practically nothing to a number of inches. The solution of the problem depends upon a knowledge of conditions that are not now apparent on the weather chart, and some of this knowledge,at least, we have well-founded hopes of obtaining in the future through a systematic investigation and discussion of the phenomena of the upper atmosphere.

A METHOD OF ADVERTISING CLIMATE.

By FORD A. CARPENTER, Local Forecaster. Dated San Diego, Cal., May 8, 1909.

It is difficult to advertise a climate properly, for statistical tables, columns of figures and weather charts may be ever so carefully compiled and attractively labelled, but the general public balk at tables and charts. The Board of Supervisors of the county of San Diego, Cal., provided the necessary funds to prepare an attractive and practical method of showing features of the climate of San Diego at the Alaska-Yukon-Pacific Exposition at Seattle, Wash.

The San Diego climatic exhibit consists of three pieces of apparatus. To show the cool summers and the warm winters of San Diego an electric-flasher-board has been designed. This consists of a sign 7 feet high and 8 feet long, having vertical lines and horizontal divisions showing the months of the year, and temperatures from 30° to 90°. A row of red electric lights outlines the maximum temperature for every month of the year, and a row of blue electric lights the minimum temperature for the corresponding period. Beginning with January, the red lights burn consecutively, two lights foreach month until the whole year's monthly maximum temperatures are displayed. The illuminated trace requires about 10 seconds to traverse the 12 months. These lights then disappear, and a line of blue lights is begun on the minimum portion of the board. When the line of blue lights is complete, showing the lowest point the thermometer touched in each month, the red and the blue lines are exhibited simultaneously for 10 seconds. Immediately afterwards the red line of lights again begins its trace over the sign, and is again followed by the blue line, and so on as long as the current flows.

To show the current daily maximum temperature in San Diego during the summer of the exposition, there is a representation of a thermometer 7 feet high. Red lights serve to make each 10-degrees point on its scale, and a movable hand, studded with small white lamps, points to the highest temperature at San Diego for the preceding day as officially reported by the local Weather Bureau office at Seattle.

The third piece shows the cool summers and the warm winters of San Diego. The countries of the earth are outlined in color on the inside of a ground glass globe 24 inches in diameter and illuminated by a lamp at its center. On the surface of the globe red and blue lines show the July and January positions respectively of the 50°, 60°, and 70° isotherms for the whole

[1] Monthly Weather Review, January, 1906, 34:23-24.